

compliance with this requirement. If the reading of the altimeter, when on the alternate static pressure system, differs from the reading of altimeter when on the primary static system by more than 50 feet, a correction card must be provided for the alternate static system.

(d) Except for the vent into the atmosphere, each system must be airtight.

(e) Each pressure altimeter must be approved and calibrated to indicate pressure altitude in a standard atmosphere with a minimum practicable calibration error when the corresponding static pressures are applied.

(f) Each system must be designed and installed so that an error in indicated pressure altitude, at sea level, with a standard atmosphere, excluding instrument calibration error, does not result in an error of more than ± 30 feet per 100 knots speed. However, the error need not be less than ± 30 feet.

(g) Except as provided in paragraph (h) of this section, if the static pressure system incorporates both a primary and an alternate static pressure source, the means for selecting one or the other source must be designed so that—

(1) When either source is selected, the other is blocked off; and

(2) Both sources cannot be blocked off simultaneously.

(h) For unpressurized rotorcraft, paragraph (g)(1) of this section does not apply if it can be demonstrated that the static pressure system calibration, when either static pressure source is selected, is not changed by the other static pressure source being open or blocked.

(Secs. 313(a), 601, 603, 604, and 605 of the Federal Aviation Act of 1958 (49 U.S.C. 1354(a), 1421, 1423, 1424, and 1425); and sec. 6(c), Dept. of Transportation Act (49 U.S.C. 1655(c)))

[Doc. No. 5084, 29 FR 16150, Dec. 3, 1964, as amended by Amdt. 29-14, 42 FR 36972, July 18, 1977; Amdt. 29-24, 49 FR 44439, Nov. 6, 1984]

§ 29.1327 Magnetic direction indicator.

(a) Each magnetic direction indicator must be installed so that its accuracy is not excessively affected by the rotorcraft's vibration or magnetic fields.

(b) The compensated installation may not have a deviation, in level flight, greater than 10 degrees on any heading.

§ 29.1329 Automatic pilot system.

(a) Each automatic pilot system must be designed so that the automatic pilot can—

(1) Be sufficiently overpowered by one pilot to allow control of the rotorcraft; and

(2) Be readily and positively disengaged by each pilot to prevent it from interfering with the control of the rotorcraft.

(b) Unless there is automatic synchronization, each system must have a means to readily indicate to the pilot the alignment of the actuating device in relation to the control system it operates.

(c) Each manually operated control for the system's operation must be readily accessible to the pilots.

(d) The system must be designed and adjusted so that, within the range of adjustment available to the pilot, it cannot produce hazardous loads on the rotorcraft, or create hazardous deviations in the flight path, under any flight condition appropriate to its use, either during normal operation or in the event of a malfunction, assuming that corrective action begins within a reasonable period of time.

(e) If the automatic pilot integrates signals from auxiliary controls or furnishes signals for operation of other equipment, there must be positive interlocks and sequencing of engagement to prevent improper operation.

(f) If the automatic pilot system can be coupled to airborne navigation equipment, means must be provided to indicate to the pilots the current mode of operation. Selector switch position is not acceptable as a means of indication.

[Doc. No. 5084, 29 FR 16150, Dec. 3, 1964, as amended by Amdt. 29-24, 49 FR 44439, Nov. 6, 1984; Amdt. 29-24, 49 FR 47594, Dec. 6, 1984; Amdt. 29-42, 63 FR 43285, Aug. 12, 1998]

§ 29.1331 Instruments using a power supply.

For category A rotorcraft—

(a) Each required flight instrument using a power supply must have—

§ 29.1333

(1) Two independent sources of power;
(2) A means of selecting either power source; and

(3) A visual means integral with each instrument to indicate when the power adequate to sustain proper instrument performance is not being supplied. The power must be measured at or near the point where it enters the instrument. For electrical instruments, the power is considered to be adequate when the voltage is within the approved limits; and

(b) The installation and power supply system must be such that failure of any flight instrument connected to one source, or of the energy supply from one source, or a fault in any part of the power distribution system does not interfere with the proper supply of energy from any other source.

[Doc. No. 5084, 29 FR 16150, Dec. 3, 1964, as amended by Amdt. 29-24, 49 FR 44439, Nov. 6, 1984]

§ 29.1333 Instrument systems.

For systems that operate the required flight instruments which are located at each pilot's station, the following apply:

(a) Only the required flight instruments for the first pilot may be connected to that operating system.

(b) The equipment, systems, and installations must be designed so that one display of the information essential to the safety of flight which is provided by the flight instruments remains available to a pilot, without additional crewmember action, after any single failure or combination of failures that are not shown to be extremely improbable.

(c) Additional instruments, systems, or equipment may not be connected to the operating system for a second pilot unless provisions are made to ensure the continued normal functioning of the required flight instruments in the event of any malfunction of the additional instruments, systems, or equipment which is not shown to be extremely improbable.

[Amdt. 29-24, 49 FR 44439, Nov. 6, 1984]

§ 29.1335 Flight director systems.

If a flight director system is installed, means must be provided to in-

14 CFR Ch. I (1-1-14 Edition)

dicate to the flight crew its current mode of operation. Selector switch position is not acceptable as a means of indication.

(Secs. 313(a), 601, 603, 604, and 605 of the Federal Aviation Act of 1958 (49 U.S.C. 1354(a), 1421, 1423, 1424, and 1425); and sec. 6(c), Dept. of Transportation Act (49 U.S.C. 1655(c)))

[Amdt. 29-14, 42 FR 36973, July 18, 1977]

§ 29.1337 Powerplant instruments.

(a) *Instruments and instrument lines.*

(1) Each powerplant and auxiliary power unit instrument line must meet the requirements of §§ 29.993 and 29.1183.

(2) Each line carrying flammable fluids under pressure must—

(i) Have restricting orifices or other safety devices at the source of pressure to prevent the escape of excessive fluid if the line fails; and

(ii) Be installed and located so that the escape of fluids would not create a hazard.

(3) Each powerplant and auxiliary power unit instrument that utilizes flammable fluids must be installed and located so that the escape of fluid would not create a hazard.

(b) *Fuel quantity indicator.* There must be means to indicate to the flight crew members the quantity, in gallons or equivalent units, of usable fuel in each tank during flight. In addition—

(1) Each fuel quantity indicator must be calibrated to read “zero” during level flight when the quantity of fuel remaining in the tank is equal to the unusable fuel supply determined under § 29.959;

(2) When two or more tanks are closely interconnected by a gravity feed system and vented, and when it is impossible to feed from each tank separately, at least one fuel quantity indicator must be installed;

(3) Tanks with interconnected outlets and airspaces may be treated as one tank and need not have separate indicators; and

(4) Each exposed sight gauge used as a fuel quantity indicator must be protected against damage.

(c) *Fuel flowmeter system.* If a fuel flowmeter system is installed, each metering component must have a means for bypassing the fuel supply if malfunction of that component severely restricts fuel flow.